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(54) **Heating Radiator**

(57) This invention relates to a heating radiator (1, 10, 100) comprising at least two radiant elements (2, 20, 200) provided with a passage for a heat transfer fluid, in which the two elements (2, 20, 200) have a tubular structure and are installed in series with respect to the delivery of the heat transfer fluid, in which each element (2, 20, 200) is divided at least in a first (6, 60, 600) and a second communicating chamber (6A, 60A, 600A).

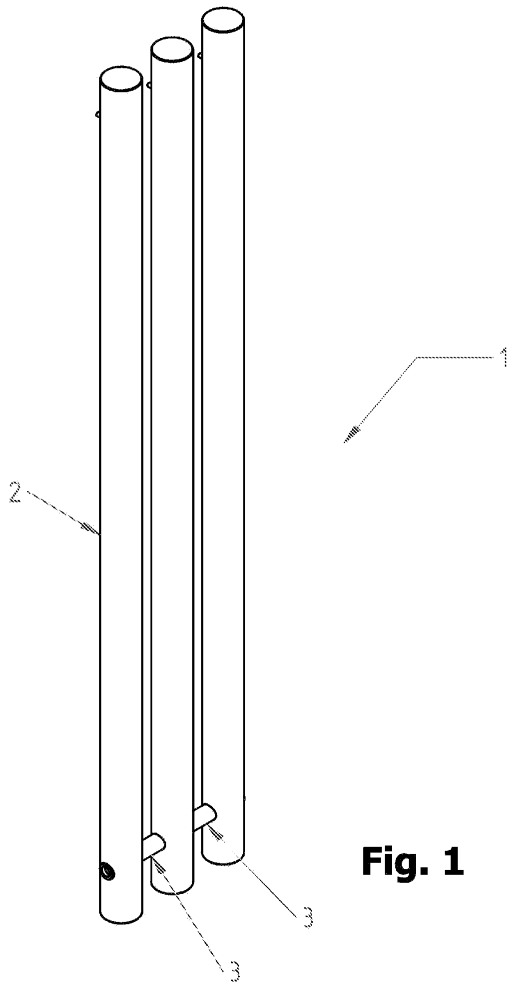

Fig. 1

EP 2 015 015 A2

Description

[0001] The present invention relates to a heating radiator comprising at least two radiant elements for the passage of a heat transfer fluid, in which the two radiant elements consist in tubes.

[0002] For the sake of brevity, the radiant elements will be defined as "elements" in the description below.

[0003] Radiators of the aforementioned type are known and largely used on the market in spite of some drawbacks.

[0004] Traditional radiators, in particular heating radiators, according to the known technology comprise more than one element.

[0005] According to the known art, each radiator element is typically connected to the delivery and return conduit.

[0006] The elements are fed in parallel with heat transfer fluid from the delivery conduit, meaning that the hot fluid, typically water, fed by the delivery conduit and coming from the heating system, simultaneously passes through all the radiator elements, which are fed in parallel with heat transfer fluid.

[0007] The heat transfer fluid is then conveyed from the elements into the return conduit, which in turns conveys the heat transfer fluid back into the installation.

[0008] The delivery and return conduits must be contemporaneously connected to all the elements of the radiator and their length is therefore basically equal to the horizontal dimension of the radiator, being normally positioned on the top and on the bottom of the radiator respectively, according to the known art.

[0009] In general, the delivery conduit is provided on top of the radiator and the return conduit is provided on the bottom of the radiator.

[0010] In the particular case of "towel-warmers", the height of the delivery and return conduits is basically equal to the vertical dimension of the radiator and are normally positioned on the right and left-hand side of the radiator, respectively.

[0011] The presence of the delivery and return conduits in the radiator limits the number of possible configurations of radiator to be realised, being always necessary to foresee two conduits, one for feeding and one for discharge, e.g. delivery and return conduits.

[0012] Moreover, the presence of the delivery and return conduits involves an additional disadvantage, that is to say heavy weight and high cost.

[0013] The purpose of the present invention is to realise a radiator able to provide a simple, inexpensive solution to the drawbacks of known radiators.

[0014] The aforementioned purposes are achieved by means of the present invention with a heating radiator comprising at least two elements provided with a passage for a heat transfer fluid, in which the two elements are installed in series with respect to the delivery of the heat transfer fluid.

[0015] In other words, the elements are fed in parallel with the heat transfer fluid from the delivery conduit, meaning that the hot fluid, typically water, fed by the delivery conduit and coming from the heating system, consecutively passes through the radiator elements, which are fed in series with heat transfer fluid.

[0016] Then, the heat transfer fluid enters the delivery conduit, passes through the heating elements and is finally conveyed from the last element into the return conduit that directs it back to the installation.

[0017] A first advantage consists in the fact that the delivery and return conduits do not necessarily have the same length as the radiator and are extremely reduced in size, possibly consisting in a simple union that connects the radiator to the heating system.

[0018] According to the present invention, in order to ensure the continuity of the hydraulic circuit, the various elements of the radiator are connected with simple unions that connect each element to the following or preceding one, thus ensuring the continuous passage of the heat transfer fluid.

[0019] A further advantage of the present invention consists in the fact that the feeding in series of the elements allows to produce a large number of configurations, without being limited by the presence of a delivery and a return conduits with basically the same length as the radiator.

[0020] An additional advantage consists in the fact that the radiator according to the present invention has a light-weighted and inexpensive structure, because of the extreme compactness of the delivery and return conduits.

[0021] Further characteristics and improvements are the object of the appended claims and subclaims.

[0022] The characteristics of the invention and the consequent advantages will be more evident following to a detailed description of drawings, whereby:

Fig. 1 is a perspective view of a first preferred embodiment of the radiator of the present invention;
Fig. 2 is a longitudinal cross-sectional view of the preferred embodiment shown in fig. 1 according to the present invention;
Fig. 3 is an enlarged view of a detail of the longitudinal cross-sectional view of the preferred embodiment shown in figs. 1 and 2 according to the present invention;
Fig. 4 is a perspective view of a second embodiment of the present invention;
Fig. 5 is a longitudinal cross-sectional view of the embodiment shown in fig. 4 according to the present invention;
Fig. 6 is a perspective view of an additional embodiment of the radiator of the present invention;
Fig. 7 shows a detail of the longitudinal cross-sectional view of the embodiment shown in fig. 6.

[0023] Fig. 1 relates to a preferred embodiment of the said radiator according to the present invention.

[0024] Fig. 1 illustrates a radiator (1), in particular a heating radiator, comprising three elements (2), obtained according to the present invention.

[0025] In this illustrative, non-limiting example, the elements (2) are vertical elements.

[0026] According to the embodiment shown in fig. 1, the elements (2) have a cylindrical tubular shape, although any type of shape is possible.

[0027] The elements (2) are connected by means of unions (3) that allow for the passage of the heat transfer fluid between the elements.

[0028] As it can be seen, no delivery or return conduits are provided, because the elements are installed in series and therefore each element receives the heat transfer fluid from the preceding element and transfers it to the following element, except for the first and last element that receive the heat transfer from the heating system and discharge it back in the heating system, respectively.

[0029] As seen in fig. 1, the heat transfer fluid is fed from the heating system to the right-hand element, passes through the first element, the central element and the left-hand element, and is finally returned to the heating system (not shown).

[0030] Therefore the elements are fed in series. The difference with traditional radiators appears evident, together with the definition of "in series" and "parallel" installation, if we consider the aforementioned operating principle and the fact that according to the known technology the radiator of fig. 1 would have two conduits - a delivery and a return conduit - and the elements would be contemporaneously fed in parallel.

[0031] The passage of the heat transfer fluid inside the elements will be illustrated with greater detail below.

[0032] The passage of the fluid between elements is obtained by means of unions (3) situated between adjacent elements.

[0033] According to the embodiment shown in fig. 1, the union (3) has a cylindrical tubular shape.

[0034] The shape of the unions may be advantageously changed according to the specific requirements, without departing from the precepts of the present invention.

[0035] Figs. 2 and 3 show a longitudinal cross-section view and a detail of the longitudinal cross-sectional view of the embodiment shown in fig. 1.

[0036] As seen in figs. 2 and 3, the elements (2) are divided into two chambers, a first (6) and a second chamber (6A), for example by means of a partition (4). Nevertheless, the two chambers may be obtained in different ways, as illustrated below. The two chambers (6, 6A) are communicating chambers.

[0037] In the embodiment of figs. 2 and 3, the partition (4) has a rectangular shape, the length of the longer side being lower than the length of the longitudinal cross-section of the element (2), such as to create communication between the first chamber (6) and the second chamber (6A) in the proximity of the end opposite to the union (3), as shown in fig. 2.

[0038] The union (3) connects all the elements (2).

[0039] According to the embodiment shown in fig. 2, the union (3) is advantageously obtained as a single tube that passes through all the elements and communicates with them by means of suitable openings, it being also provided with walls (5) that divide the union (3) into different sections, thus fractioning the tube of the union.

[0040] In particular, the union (3) is provided with walls (5) in the partitions (4), which separate the tube of the union (3) in different areas, each area being comprised between each pair of elements (2).

[0041] This type of union, which consists in a tube provided with walls, is especially advantageous because it allows for easy installation of the union on the elements with a lower cost, if compared with individual unions installed between each pair of elements.

[0042] The heat transfer fluid is conveyed from the union (3) into the first chamber (6) of the first element. The heat transfer fluid flows in the first chamber (6) of the first element along the partition (4), reaches the end of the partition (4) and passes into the second chamber (6A) of the first element.

[0043] After passing through the second chamber (6A) of the first element, the heat transfer fluid flows into the union (3) and is conveyed into the first chamber (6) of the second element. The heat transfer fluid flows in the first chamber (6) of the second element along the partition (4), reaches the end of the partition (4) and passes into the second chamber (6A) of the second element. After passing through the second chamber (6A) of the second element, the heat transfer fluid flows into the union (3) and is conveyed into the first chamber (6) of the following element. After passing through the second chamber (6A) of the last element, the heat transfer fluid flows into the union (3) and is conveyed into the heating system.

[0044] "First element" means the element that is fed first, "second element" means the element that is fed second, and so on.

[0045] Any number of elements is possible.

[0046] According to alternative embodiments, the division of the element (2) in two chambers is obtained by means of systems with an external and an internal tube, that is to say of the so-called "tube-in-tube" type.

[0047] Figs. 4 and 5 show a second preferred embodiment of the present invention in which the elements are installed in series relative to the feeding direction of the heat transfer fluid.

[0048] The figures illustrate a radiator (10), in particular a heating radiator, comprising multiple elements (20).

[0049] As seen in figs. 4 and 5, the elements (20) are horizontal elements and are connected by the union (30).According to this embodiment, the union (30) is obtained as a single tube with square cross-section.

[0050] The union (30) is connected to a free end of the elements (20).

[0051] The elements (20) and the union (30) have a parallepiped shape with polygonal cross-section, specifically a square shape according to this embodiment.

[0052] The elements (20) are divided into two chambers, a first chamber (60) and a second chamber (60A) by means of a partition (40).

[0053] According to this embodiment, the partition (40) protrudes in the area of the element to be mated with the union (30) with respect to the walls of the same element (20), at a distance and with a shape basically complementary to the ones of the internal volume of the union (30) in the mounting area, such that the partition (40) acts as divider between the first chamber (60) and the second chamber (60A) of the element (20) and also as wall for the union (30).

[0054] The length of the partition (40) is lower than the longitudinal cross-section of the element (20) such as to put in communication the first chamber (60) with the second chamber (60A), as illustrated for figs. 2 and 3.

[0055] As seen in figs. 4 and 5, the passage of the fluid in series, being a precept of the present invention, and the absence of the two separate delivery and return conduits of the known art, permit to realise radiators with any type of shape, characterised by a lower weight.

[0056] Figs. 6 and 7 illustrate an additional embodiment of the present invention in which the elements (200) of the radiator (100) are installed in series with respect to the delivery of the heat transfer fluid.

[0057] In this embodiment, the union (300) is positioned on the body of the elements (200), and not at the ends, such in the previously illustrated embodiments.

[0058] As seen in the longitudinal cross-section of fig. 7, also in this embodiment the heat transfer fluid passes through one element (200) at a time.

[0059] The heat transfer fluid is conveyed by the union (300) into the first chamber (600) of the first element. In this embodiment, because the union (300) is positioned on the body, or in intermediate position, of the elements (200), the heat transfer fluid passes through the first chamber (600) of the first element in both directions.

[0060] In this embodiment, the length of the partition (400) is lower than the length of the longitudinal cross-section of the element (200) and provides communication between the first (600) and the second (600A) chamber in the proximity of the two ends of the said elements (200).

[0061] The flow of the first chamber (600) passes into the second chamber (600A) and is then conveyed in the union (300).

[0062] From the union (300) the flow passes into the first chamber (600) of the second element. Basically, half of the fluid passes through the first chamber in one direction and the other half of the fluid passes in the opposite direction.

[0063] After it reaches the ends of the element (200) in the proximity of the communication passages with the second chamber (600A), the heat transfer fluid passes into the second chamber (600A) and is conveyed again in the union.

[0064] In this case no walls are provided on the union (300) because the feeding of the elements in series does not require the presence of a wall due to the special arrangement of the elements (200) relative to the union (300).

[0065] Advantageously, it can be noted that the elements can be arranged as desired, since the arrangement is not constrained by the presence of the two conduits - the delivery and return conduits - thus permitting the construction of radiators of any shape.

[0066] Advantageous combinations of the characteristics illustrated and described in the preceding embodiments are possible, and moreover each element (2, 20, 200) can be divided into the first and second chamber (6, 60, 600, 6A, 60A, 600A) by placing two separate elements with one chamber only in adjacent position, and not by means of a partition.

[0067] Moreover, the union (3, 30, 300) can be obtained on the same side of the elements (2, 20, 200) or, alternatively, for instance on one side, on the opposite side or according to any arrangement, being possible to obtain circular radiators composed of a series of elements installed in series according to a circular, spiral, square, cubic, parallelepiped or similar shape.

[0068] Finally, more than two chambers can be provided in some or all elements (2, 20, 200) with any shape and size, without departing from the precepts of the present invention.

Claims

1. Heating radiator (1, 10, 100) of the type comprising at least two radiant elements (2, 20, 200) provided with a passage for the heat transfer fluid **characterised by** the fact that the two elements (2, 20, 200) have a tubular structure and are installed in series for the delivery of the heat transfer fluid.

2. Radiator (1, 10, 100) as claimed in claim 1, **characterised by** the fact that it includes three, four or multiple elements (2, 20, 200), being the said elements (2, 20, 200) installed in series for the delivery of the heat transfer fluid.

3. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that it comprises a union (3, 30, 300) to allow the heat transfer fluid to pass from one element (2, 20, 200) to the adjacent one.

4. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that each element (2, 20, 200) is divided into at least a first (6, 60, 600) and a second communicating chamber (6A, 60A, 600A) by a partition (4, 40, 400).

5. Radiator (1, 10, 100) as claimed in claim 3, **characterised by** the fact that each element (2, 20, 200) is divided at least into a first (6, 60, 600) and a second communicating chamber (6A, 60A, 600A), being the said chamber obtained with an external and an internal tube, that is to say of the so-called "tube-in-

tube" type.

6. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that the elements (2, 20, 200) are installed in series such that each element receives the heat transfer fluid from the previous element and delivers the said fluid into the following element by means of unions (3, 30, 300) and in which the first and last element receive the said fluid from the system and deliver it again into the system, respectively.

7. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that the union (3, 30) has a cylindrical shape similar to a tube with any cross-section, being the said elements (2, 20) operatively connected to the said union (3, 30) at one end of the elements (2, 20).

8. Radiator (1) as claimed in claim 7, **characterised by** the fact that the union (3) is obtained with a tube provided with walls (5) designed to divide the union (3) in different sections, thus fractioning the tubular union, being the said walls (5) situated on the partitions (4) and the said sections of the union provided between each pair of heating elements (2) installed in series.

9. Radiator (10) as claimed in claim 7, **characterised by** the fact that the said elements (20) are divided into two chambers, the first chamber (60) and the second chamber (60A) by means of a partition (40), the said partition (40) protruding in the area of the element to be mated with the union (30) with respect to the walls of the same element (20), at a distance and with a shape basically complementary to the ones of the internal volume of the union (30) in the mounting area, such that the partition (40) acts as wall for the union (30).

10. Radiator (10) as claimed in claim 9, **characterised by** the fact that the elements (20) and the union (30) have a parallelepiped shape with polygonal cross-section, in particular a square shape in this embodiment of the invention.

11. Radiator (100) as claimed in claim 6, **characterised by** the fact that the union (300) is positioned on the body of the elements (200) in any intermediate position between the ends of the element (200).

12. Radiator (100) as claimed in claim 11, **characterised by** the fact that the length of the partition (400) is lower than the length of the longitudinal cross-section of the element (200) and provides communication between the first (600) and the second (600A) chamber in the proximity of the two ends of the said elements (200).

13. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that the said element (2, 20, 200) is divided at least into the first and second chamber (6, 60, 600, 6A, 60A, 600A) by placing two separate elements with only one chamber each in adjacent position.

14. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that the said union (3, 30, 300) is obtained on the same side of the elements (2, 20, 200) or alternatively, on one side, on the opposite side or according to any type of arrangement.

15. Radiator (1, 10, 100) as claimed in one or more of the preceding claims, **characterised by** the fact that three, four or more chambers are provided in some or all elements (2, 20, 200) with any shape and size.

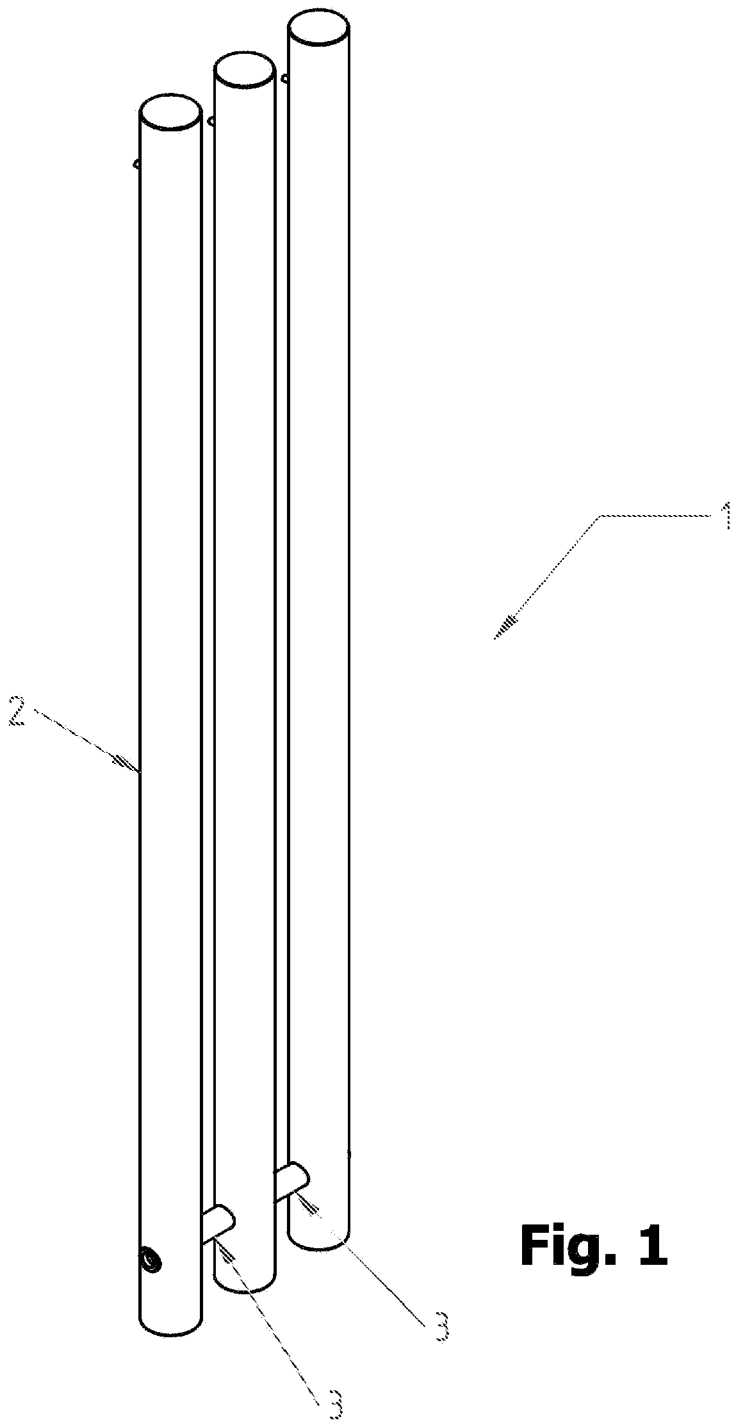

Fig. 1

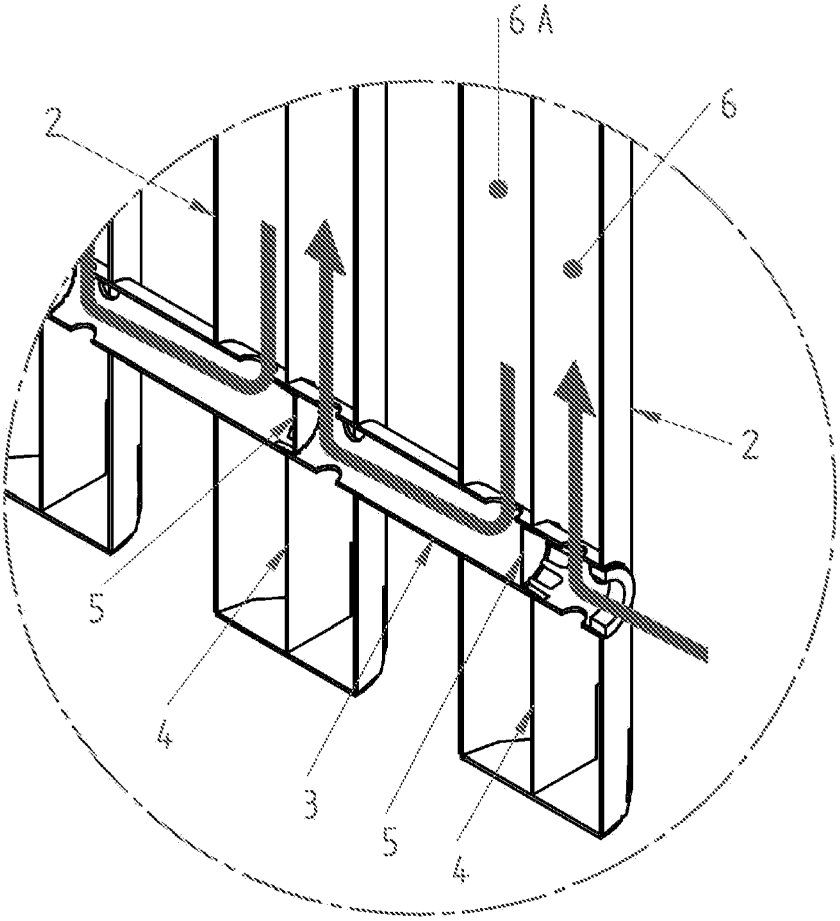

Fig. 3

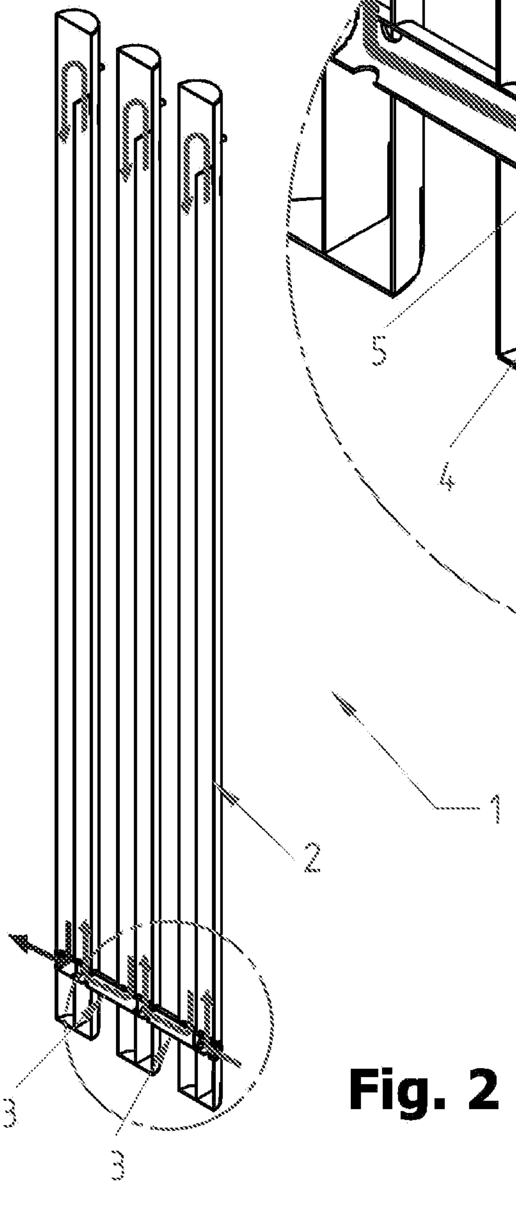

Fig. 2

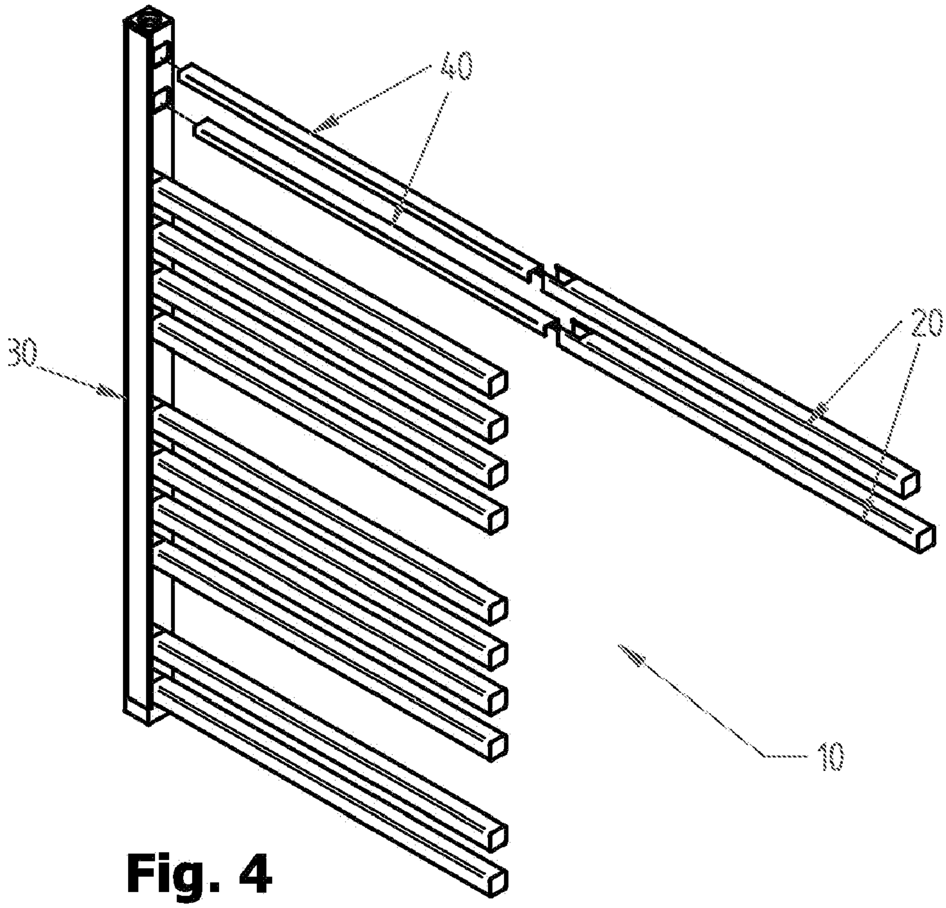

Fig. 4

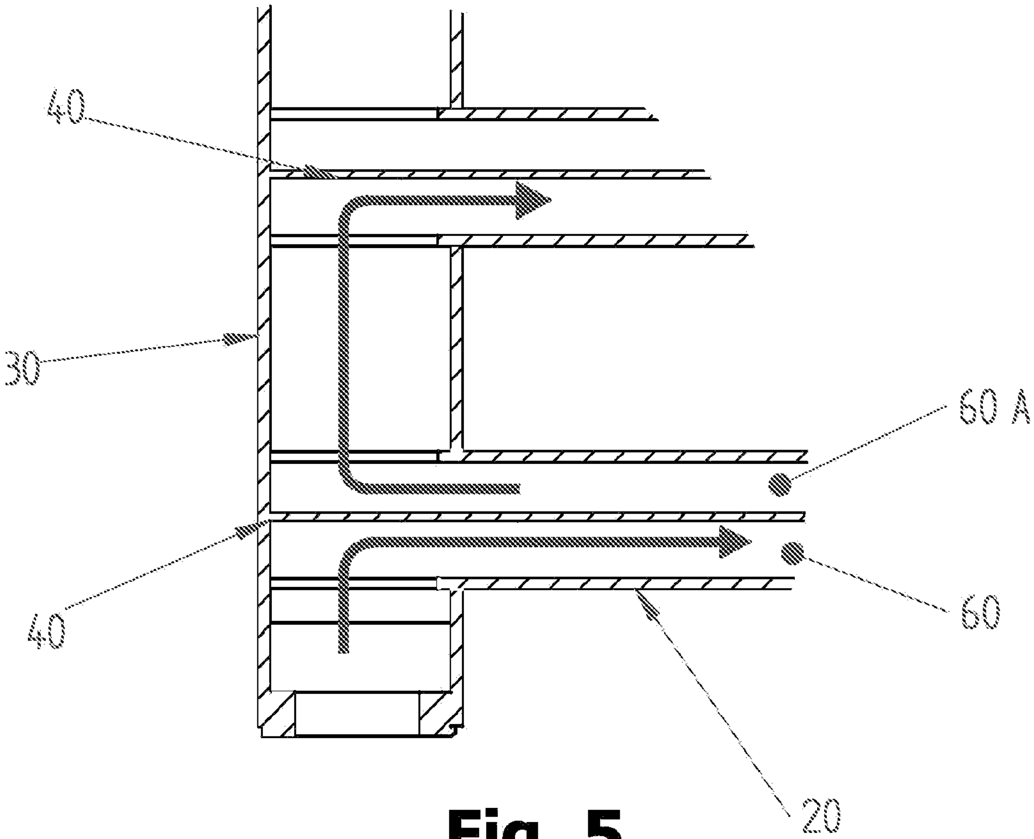

Fig. 5

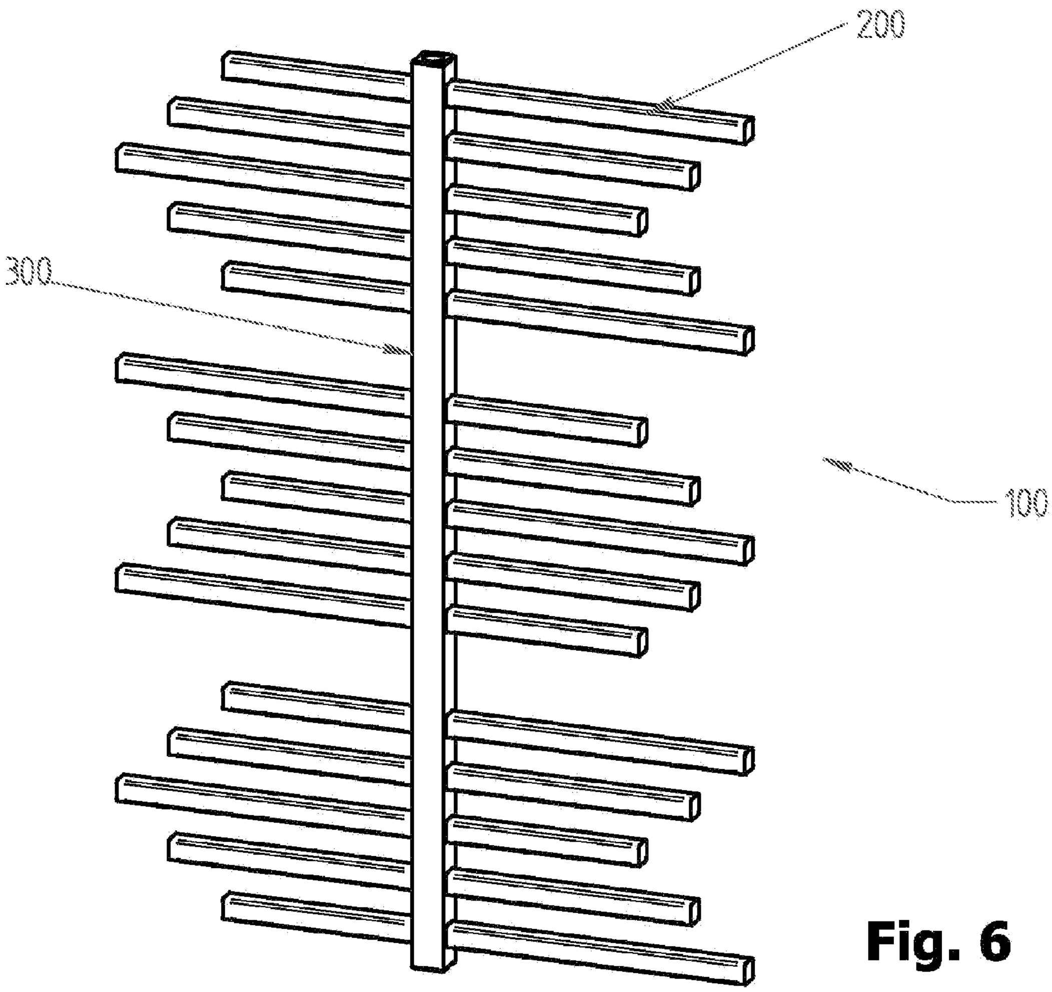

Fig. 6

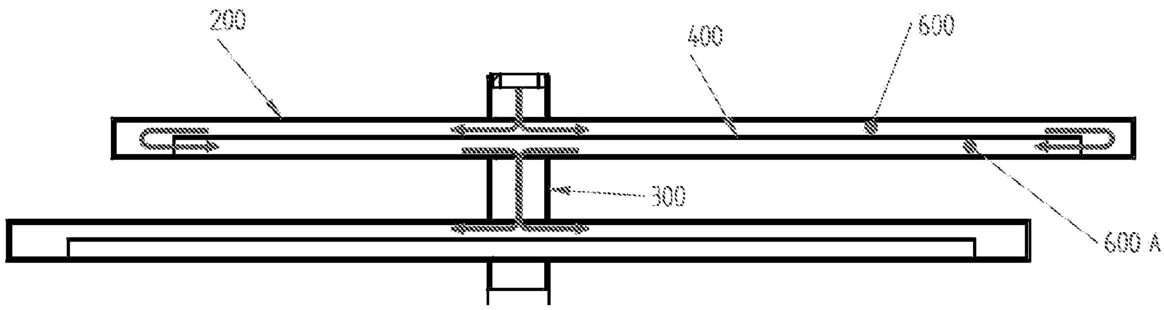

Fig. 7